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How often are Ameloblastomas in Middle Anatolia? A 13-year retrospective study

Prevalance of Ameloblastomas' in Middle Anatolia

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Abstract

Aim: Ameloblastoma is a neoplasm classified as a benign epithelial odontogenic tumor of the jaws. It may show locally invasive behavior resulting in recurrence and malignancy. The aim of the present study was to analyze the incidence, clinicopathologic and radiographic characteristics, treatment, and recurrence of patients with ameloblastoma.

Materials and Methods: This retrospective study included patients who were diagnosed with ameloblastoma from 2007 to 2019. Data of patients including gender, age at diagnosis, radiologic form, tumor location, type of surgical treatment, and recurrences were reviewed and analyzed retrospectively.

Results: A total of 3043 pathology reports were examined and twenty patients diagnosed with ameloblastoma were included in this study. There were seven men and thirteen women (a male: female ratio of 1:1.8). The age of participants ranged from 14 to 79 years (average 39.35 years). The peak incidence was recorded in the third decade of life (n=5). The most common site was the body of the mandible (n=15, 75%). The multilocular and unilocular types of ameloblastoma were noted in twelve and eight cases, respectively. Patients were treated by conservative surgery in 40% of cases and radical surgery with/without reconstruction in 60% of cases. The recurrence rate was 20% in the present study.

Discussion: Ameloblastomas were considered as the most common odontogenic tumor within the prevalence rate of between 0.21% and 0.83% in Turkey. The incidence rate in the present study (%0.65) is consistent with the literature. In the present study, the incidence of ameloblastoma was found to be 0.65%, and the most common treatment method was resection. Considering other disciplines involved in diagnosis and treatment, the incidence of ameloblastoma may be higher. Therefore, further multicenter studies are needed for an accurate assessment.

Keywords

Ameloblastoma; Odontogenic tumour; Benign neoplasm

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Introduction

The term ameloblastoma is derived from 'amel' which means enamel in English and 'blastos' which means germ in Greek [1]. This lesion was first described by Cusack in a case report of mandibulectomy in 1827 [2].

Ameloblastoma is classified as a benign epithelial odontogenic tumor of the maxillomandibular complex. It is defined as a locally invasive and aggressive, however, metastasis to lymph nodes and distant sites is rare [3]. Ameloblastoma has slow growth potential and is usually asymptomatic in patients [4]. It is often diagnosed by panoramic radiographs during a routine dental examination. Ameloblastoma presents as either unilocular or multilocular "soap bubble" radiolucency on radiographies [5]. Displacement of teeth, root resorption, inferior alveolar canal displacement or degradation, buccolingual cortical expansion, soft tissue invasion are the most common clinical and radiological findings [6]. Although radiological features of tumor are specific, a biopsy is compulsory for accurate diagnosis [4]. Histologically, it can be unicystic or multicystic [4]. The most common histopathological patterns in ameloblastoma are follicular and plexiform patterns. Other microscopic patterns can be listed as an acanthomatous, granular, desmoplastic, and basal cells. These patterns can be uniform or mixed [7].

Ameloblastomas comprise 1% of all oral and maxillofacial biopsy specimens [8]. According to the World Health Organization (WHO 2005), ameloblastoma alone accounts for about 23% of all odontogenic tumors and shows no clear gender distinction. It is most commonly diagnosed in adults between the third to fifth decades of life [10]. While more than 80% of these tumors appear in the mandible, 70% occur in the molar-ramus region [10].

Changes in terminology and classification were made in line with the updated information in current genetic studies [11]. The new classification of the World Health Organization (WHO) in 2017 categorizes four types of benign ameloblastoma: conventional, unicystic, extraosseous/peripheral, and metastasizing (malignant) ameloblastoma [12].

The aim of this study was to examine the cases of ameloblastoma, to emphasize the age, gender, location, clinical-pathological-radiographical features of this tumor, as well as to evaluate the treatment modalities and recurrence rates of these tumors retrospectively under the light of the new WHO classification.

Material and Methods

The design of the study was approved by the Local Ethical Committee for Clinical Research of Erciyes University (2020/338). In the present retrospective study, the pathology reports from January 2007 to December 2019 were retrieved from the files available in the archives of the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, University of Erciyes. The inclusion criteria were patients who were diagnosed with ameloblastoma and received treatment. The exclusion criteria were listed as incomplete records and histopathological diagnoses other than ameloblastoma. Data from each patient, including gender, age at the diagnosis, histologic type, tumor location, radiographic appearance (radiologic form), root resorption, surgical treatment, reconstruction, duration of follow-up, and recurrence rates were collected. Radiographic findings were recorded from Orthopantomograms (OPGs) and cone-beam computed tomography (CBCT) scans.

For analysis of mandibular ameloblastomas, the site of occurrence was divided into five regions: 1) Symphysis (canine - canine), 2) Body (canine - third molar), 3) Ramus (third molar - condyle), 4) Coronoid process and 5) Condyle. For maxillary tumors, the site was divided into two regions: anterior (incisal - canine) and posterior (distal to canine). The treatment methods were classified into two groups: conservative treatment (i.e. enucleation, enucleation with bone curettage or enucleation with bone curettage after marsupialization) and radical treatment (i.e. marginal, segmental or partial resection). The same classification was performed for recurrent cases. All cases were assessed based on WHO 2017 classification. A descriptive statistical analysis was used in the present study.

Results

A total of 3043 pathology reports were examined and twenty patients diagnosed with ameloblastoma were included in this study. The incidence of ameloblastoma was found to be 0.65% among all jaw neoplasms.

Demographic Findings

The patients' ages ranged from 14 to 79 years. The mean age of patients at the time of diagnosis was 39.35 years. The peak incidence was in the third decade (n=5). Male to female ratio was 1:1.8 (7 Male – 13 Female).

Radiological Findings

The multilocular and unilocular radiologic form was scored in 12 (60%) and eight cases (40%), respectively. Root resorption of a variable degree was clearly observed on OPG and/or CBCT in 11 cases (55%).

The majority of tumors were located in the mandible (95%) compared to the maxilla (5%), with the posterior aspect of the jaws being the most common subsite affected (85%). Nearly all tumors were unilateral (90%), with the left sides of the jaws are more affected than the right sides (n=8 left, n=11 right). Out of these 20 ameloblastoma cases, 18 cases (90%) had unilateral involvement of jaw and two cases (10%) had bilateral involvement. Ameloblastoma was seen in symphysis in three cases (15.78%), in the body in six cases (31.57%), in ramus in one case (5.26%), symphysis and body in one case (5.26%) and the body and ramus in six cases (31.57%). In two patients, there was an involvement of the coronoid process and the condyle, off which, only two tumors crossed the midline of the mandible. And the mandibular body was the most affected site (n=15, 78.94%) in mandibular ameloblastomas. A single case of maxillary ameloblastoma was observed; this tumor included the maxillary posterior region and also affected the maxillary sinus (Table 1).

Pathological Findings

Conventional ameloblastoma was diagnosed in 15 patients and unicystic ameloblastoma in five patients. The follicular ameloblastoma was seen in two patients. There was only one patient with the plexiform type. However, there were no cases of extraosseous/peripheral ameloblastoma or metastasizing (malignant) ameloblastoma. The conventional type was predominated (75%).

Surgical Treatment and Reconstruction

Table 1. Clinico-pathological parameters of cases

	Cases (n)	Percentage (%)
Age distribution, years		
10-19	2	10%
20-29	5	25%
30-39	4	20%
40-49	2	10%
50-59	4	20%
60-69	2	10%
70-79	1	5%
Gender		
male	13	65%
female	7	35%
total	20	100%
Radiologic form/appearance		
multilocular	12	60%
unilocular	8	40%
Tumor type		
conventional	15	75%
unicystic	5	25%
Tumor location		
Maxilla		
posterior	1	5%
anterior	-	0%
Mandible		
posterior	16	80%
anterior	3	15%

Table 2. Distribution of treatment, reconstruction, and recurrence in cases

	Cases (n)	Percentage (%)
Treatments		
Conservative		
enucleation only	1	5%
enucleation with bone curettage	5	25%
enucleation after marsupialization	2	10%
Total	8	40%
Radical		
marginal resection	5	25%
segmental resection	5	25%
hemimandibulectomy	1	5%
maxillectomy	1	5%
Total	12	60%
Reconstructions (in radical treatments)		
reconstruction plates only	3	18.75%
reconstruction plates with bone graft	5	31.25%
total joint prosthesis	2	12.5%
soft tissue only	1	6.25%
none	5	31.25%
Total	16	100%
Recurrence rates		
following conservative treatment	2	25% (2/8)
following radical treatment	2	16.66% (2/12)
general	4	20% (4/20)

All patients were submitted to a surgical procedure at our hospital. Eight patients were treated conservatively (40%) and 12 patients were treated radically (60%). Five patients received marginal resection (25%), five patients received segmental resection (25%) and one patient received hemimandibulectomy (5%), while only one patient underwent a partial maxillectomy (5%). Tumour enucleation in one case, enucleation with bone curettage in five cases, enucleation with bone curettage after marsupialization in two cases was performed. Carnoy's solution was also applied to all patients who underwent bone curettage. Among all these patients, four of them underwent reoperation due to tumor recurrence. A total of 16 surgical resections were performed with the treatment of recurrent cases.

Conservative treatment was administered in eight cases (42.1%) and radical surgery was performed in 11 cases (57.9%) of mandibular ameloblastoma. Reconstruction with 2,7 mm titanium plates was performed after radical treatment. The mandibular reconstruction, when indicated, was carried out with a reconstruction plate or a total joint prosthesis with/without bone graft. Reconstruction plates were used in seven patients (except second surgery in recurred cases). Five cases were reconstructed with (non-vascularized) iliac crest bone grafts. Two (10%) patients had resection of coronoid and condyle processes and reconstruction was performed immediately with a total joint prosthesis. Five patients, who had marginal mandibulectomy, did not require any specific reconstructive procedure.

Partial maxillectomy was performed in the patient with maxillary bone involvement and soft tissue repair was provided. A prosthetic obturator was applied for the rehabilitation of the maxillectomy defect.

Follow-up and Recurrence

The follow-up period of the patients ranged from one to 13 years. During the follow-up period, four female developed recurrences, and all were located in the mandible. The ameloblastoma recurrence rate was 20%. Recurrence was mostly seen in the coronoid process. Recurrence was observed in two patients after conservative treatment (2/8) and in two patients after radical treatment (2/12). It was observed that the conventional type predominated among the recurred cases (75%). One patient that was treated conservatively developed recurrence after 10 years. In another patient, who was diagnosed with mural type unicystic ameloblastoma and received radical surgery, recurrence developed after five years. Recurrences occurred after a mean of 5.25 years following initial surgery. All of these cases were treated with surgical resection (Table 2).

Discussion

Ameloblastomas are considered the most common tumors among odontogenic tumors. The prevalence in proportion to the incidence in Turkey was reported between 0.21% and 0.83% [13-16]. In the present study, the incidence was 0.65%. Reichart et al. [18] reviewed the studies between the years 1960-1993 and 3677 cases of ameloblastoma and showed a 0.6%-5.6% recurrence rate. Hendra et. al analyzed 49 studies carried out from 27 different countries and found a 0.92% incidence of ameloblastoma [17]. Considering these local and global studies, the incidence of the present study was compatible with the

literature.

The demographic profile of ameloblastoma shows significant variation according to different geographies. In Hendra's study, the peak incidence was in the third decade [17]. In Europe and North America, ameloblastoma was mostly seen in the fifth and sixth decades while ameloblastoma was mostly seen at a younger age (the third decade) in Africa and South America. In Asia, the peak incidence was between the third and sixth decades. The global median age was 34.3 in Hendra's study [17]. In the present study, the mean age was 39.35 years, 46.28 for males, and 36.15 for females. In addition, the tumor was mostly seen in the third decade. In general, it is known that ameloblastoma does not have a gender preference. But, various studies show inconsistent findings regarding gender predilection. Hendra et al. [17] showed a 1.14:1 male/female ratio. A male predominance was reported in Africa (Male=650/Female=542), North America (Male=180/Female=124), and Asia (Male=2,218/Female=1915); Australia also reported male predominance. Female predominance was reported in South America (Male=269/Female=307) and Europe (Male=84/Female=105) [23]. The present study showed a female predilection, with a male: female ratio of 1:1.8.

Many studies have concluded that the mandible is the most affected jaw than the maxilla, and tumors were located predominantly in the body and posterior mandible [17]. In the present study, the maximum number of lesions was found in the mandible (95%) and most of these tumors were also located in the mandibular body and ramus.

Gandhi et al. reported the rate of unicystic ameloblastoma was 23% and multicystic ameloblastoma was 77% [6]. In the present study, classification was performed according to the new 2017 WHO classification, and 25% of the lesions were unicystic ameloblastomas, while 75% were conventional ameloblastomas. These results were similar to literature. Due to retrospective design, the present study comprises a case-mix of clinical (macroscopic) and histological (microscopic) forms of ameloblastoma. The results of this study must, therefore, be commented carefully.

The definitive treatment of ameloblastomas was controversial in the literature. Depending on the characteristics of the lesion and the patient, two surgical approaches have been defined for the management of ameloblastoma: ''radical'' and ''conservative''. Radical surgery consists of tumor resection with segmental mandibulectomy or maxillectomy. Conservative surgery consists of enucleation (with/without marsupialization) and bone curettage with peripheral ostectomy, cryosurgery or physico-chemical methods (e.g. Carnoy's solution). In the present study, eight conservative and 16 radical interventions were applied, and Carnoy's solution was applied following bone curettage. Marsupialization was performed according to the size of the tumor and its proximity to the anatomical formations around it. Age was also considered in the decision making of treatment choice.

The subject of resection margins also should be carefully discussed. It must be sufficiently broad to prevent possible recurrence. According to the literature, 1-1.5 cm resection margin was recommended [20]. Marx et al. showed that ameloblastoma cells can extent to cancellous bone 8 mm beyond the radiographic boundary of the lesion [19]. Surgical resection that extends at least 1 cm beyond the radiological size of the tumor is ideal treatment [20]. For this reason, all resections were achieved at least 1.5 cm beyond the radiological limit to prevent recurrences.

Approximately 20% of ameloblastomas occur in the maxilla compared to 80% in the mandible [21]. In the present study, only one case occurred in the maxilla (5%). Maxillary ameloblastomas act clinically more aggressive than mandibular ameloblastomas because maxillar bone has a cancellous structure and thin cortical walls; thus, the tumor can easily penetrate soft tissues and surrounding anatomical structures. Consequently, conservative treatments should be avoided and maxillary ameloblastoma should be treated more aggressively. In the present study, the tumor affected the posterior region and also included the maxillary sinus. The partial maxillectomy procedure was designed for this patient and the resection was performed with 1.5 cm surgical margins.

Ameloblastoma has a high recurrence rate due to its slow-growing character. In a meta-analysis, the recurrence rate of solid/multicystic ameloblastomas following radical treatment was 8%, and after conservative treatment was 41%. For unicystic ameloblastomas, these values were 3% and 21%, respectively [22]. In the present study, the recurrence rate of ameloblastoma was found to be 20%. In addition, the recurrence rate after radical treatment was 16.66%, after conservative treatment was 25%, and the most recurrent type of ameloblastoma was a conventional type. Laborde et al. reported a recurrence rate of 29.3–93% after conservative treatment; after radical treatment, the recurrence was 0-21% [23]. The results of the present study were consistent with previously published results, according to which the recurrence rate after conservative treatment was higher than radical treatment. The results of the present study confirm this propensity with a higher recurrence rate in the conservative treatment group than in the radical treatment group.

Management of a postoperative follow-up period for ameloblastoma is crucial because more than 50% of recurrences have been reported to occur within 5 years after surgery [16]. The present study confirmed these findings that 75% of recurrences occurred in the first 5 years after surgery. In the literature, some articles have reported recurrence after a 30-year silent period [24]. The shortest follow-up was 14 months in the present study and this was not considered a long adequate process to determine a reliable recurrence rate. Therefore, the eventual recurrence rate may be higher.

Due to recurrence potential, tumor surveillance in asymptomatic patients should be performed every 6 months for the first five years and every 12 months for the subsequent five years with the clinical and radiological examinations. Hasegawa et al. suggest that OPG should then be performed every 2-3 years after the first 10 years of follow-up [25]. In the present study, a routine follow-up period was established as mentioned above and the recurrence developed even after 10 years of surgical treatment. These observations reconfirmed the insidious biological behavior of this tumor and underlined the requirement for long-term follow-up. In the present study, the follow-up duration of patients ranged from 1 to 13 years and

the mean follow-up was 78 months.

The present study has several shortcomings: Due to the retrospective study design; the biopsy samples could not be re-examined histopathologically according to the new WHO (2017) classification and only former pathology reports were analyzed. In addition, this study was limited to a single center. Also, considering the other disciplines (otorhinolaryngology, head and neck surgery, plastic, reconstructive and aesthetic surgery, etc.) involved in diagnosis and treatment, the incidence of ameloblastoma may be higher in the region of study.

Conclusion

Ameloblastoma was the most common odontogenic tumor in the jaws and it occurs mainly in the third decade of life. The most common region is the posterior mandible and the conventional type was the most seen one. Resection was the most appropriate treatment option for ameloblastoma. Due to its high recurrence potential, long-term follow-up is mandatory. Further, multi-centered studies that focus on the recurrence and treatment modality of ameloblastoma in Turkey, are needed.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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